

Serial No. : 10/019,181
Filed : July 8, 2002

IN THE SPECIFICATION:

Please amend the specification of the instant application as follows:

(1) The paragraph from page 1, line 24 to page 2, line 8 has been amended as follows:

A field distribution measurement screen 100 which defines an area in which electric fields or magnetic fields are to be measured includes a probe 102 for detecting electric fields or magnetic fields. The probe 102 is connected to a probe sweep control unit 104 and can sweep in the x-axial direction and the y-axial direction. The probe 102 is connected to a measuring unit 106 which measures electric fields or magnetic fields, based on signals from the probe 102. The probe sweep control unit 104 outputs a measurement trigger signal corresponding to a position of the probe 102 and supplies the measurement trigger signal to the measuring unit 106. Data F of the electric fields or magnetic fields measured by the measuring unit 106 are recorded in a buffer memory 108 together with position information supplied by the probe sweep control unit 104. The buffer memory 108 is connected to a computing/display unit 110 which ~~develops~~ processes and ~~display~~ displays in two-dimensional plane measured data stored in the buffer memory 108.

(2) The paragraph from page 2, line 16 to page 2, line 29 has been amended as follows:

Serial No. : 10/019,181
Filed : July 8, 2002

The probe 102 continuously sweeps the field distribution measurement screen 100 without pausing at each sampling point (measuring point) so that the probe 102 can sweep without loss for maximum measurement throughput. As exemplified in FIG. 6, the probe 102 is ~~moves~~ moved in the positive direction along the x-axis, then moved by a prescribed value in the positive direction along the y-axis, next moved in the negative direction along the x-axis, then moved by a prescribed value in the positive direction along the y-axis, and then moved in the positive direction along the x-axis. The probe 102 repeats these motions ~~to be moved~~ so as to sweep substantially all the surface of the field distribution measurement screen 100 (hereinafter call such sweep "zigzag sweep").

(3) The paragraph from page 3, line 16 to page 3, line 19 has been amended as follows:

Next, the data stored by the buffer memory 108 are developed on a two-dimensional plane by the computing/display unit 110, and a two-dimensional field distribution of electric fields or magnetic fields can be ~~provided~~ displayed.

(4) The paragraph from page 4, line 16 to page 3, line 19 has been amended as follows:

Accordingly, by developing a field distribution on a two-dimensional plane, based on the position information outputted by the probe sweep control unit 104, correct two-dimensional

Serial No. : 10/019,181
Filed : July 8, 2002

images of electric fields or magnetic fields cannot be ~~provided~~ obtained.

(5) The paragraph from page 4, line 34 to page 5, line 13 has been amended as follows:

In the above-described field distribution measuring method, it is possible that the method comprises the steps of: storing a plurality of measured data ~~measured~~ obtained by the probe sweeping in a first direction together with position information of the probe as reference data; storing a plurality of measured data ~~measured~~ obtained by the probe sweeping in a second direction opposite to the first direction together with position information of the probe as adjustment data; interpolating the adjustment data to compute interpolated data with data between the sampling points interpolated; computing spatial frequency power spectra for the reference data and the interpolated data; and computing the shift amount of the sampling points, based on the spatial frequency power spectra.

(6) The paragraph from page 6, line 4 to page 6, line 20 has been amended as follows:

The above-described object can be also achieved by a field distribution measuring apparatus comprising: a probe for detecting an electric field or a magnetic field at a plurality of sampling points while continuously sweeping on a plane or in a space; a measuring unit for measuring the electric field

Serial No. : 10/019,181
Filed : July 8, 2002

or the magnetic field detected by the probe; a storing unit for storing data of the electric field or the magnetic field measured by the measuring unit together with position data of the probe; a data processing unit for computing a shift amount of sampling points generated by a displacement between a position of the probe and a measuring timing, based on data stored in the storing unit; and a computing unit for computing a spatial distribution of the electric field or the magnetic field detected by the probe, in consideration of the shift amount of the sampling points computed by the data processing unit.

(7) The paragraph from page 7, line 15 to page 7, line 16 has been amended as follows:

~~FIG. 4 is~~ FIG. 4A and FIG. 4B are views of field distributions measured by the conventional field distribution measuring method.

(8) The paragraph from page 7, line 17 to page 7, line 18 has been amended as follows:

~~FIG. 5 is~~ FIG. 5A and FIG. 5B are views of field distributions measured by the field distribution measuring method according to the embodiment of the present invention.

(9) The paragraph from page 8, line 6 to page 8, line 26 has been amended as follows:

A probe 12 for detecting electric fields or magnetic fields is provided on a field distribution measurement screen

Serial No. : 10/019,181
Filed : July 8, 2002

10. The probe 12 is connected to a probe sweep control unit 20 and can sweep in the x-axis direction and in the y-axis direction within the field distribution measurement screen 10. The probe 12 is connected to a measuring unit 30 which measures electric fields or magnetic fields, based on signals from the probe 12. The probe sweep control unit 20 generates measurement trigger signals corresponding to positions of the probe 12 to input the measurement trigger signals to the measuring unit 30. Data F_0 of an electric field or a magnetic field measured by the measuring unit 30 can be stored in ~~the~~ a buffer memory 40 together with position information supplied from the probe sweep control unit 20. The buffer memory 40 is connected to a data processing unit 50 which removes sampling noises ~~of~~ in the measured data stored in the buffer memory 40. The data processing unit 50 is connected to a computing/display unit 60 which ~~develops~~ processes the sampling noise removed data processed by the data processing unit 50 to display the data on a two-dimensional plane.

(10) The paragraph from page 9, line 28 to page 10, line 1 has been amended as follows:

Then, the probe 12 is caused to sweep by the probe control unit 20 to detect electric fields or magnetic fields at positions of the probe 12 on the field distribution measurement screen 10. In order to move the probe 12 effectively for a maximum measuring throughput, the probe 12

Serial No. : 10/019,181
Filed : July 8, 2002

sweeps continuously zigzag on the field distribution measurement screen 10 without pausing at each sampling point (measuring point).

(11) The paragraph from page 12, line 30 to page 13, line 8 has been amended as follows:

Here, first, spatial frequency power spectra for the reference sampling data and the interpolated data are given. In the ~~filed~~ field distribution measuring method according to the present embodiment, a spacial frequency power spectra for data given by the odd number-th line data $F_0(x, y_o)$ and the interpolated data $F_0'(k \cdot x + dx, y_e)$ with respect to the y-axis direction in $M/2$ are given. The symbol dx represents a parameter indicative of a shift amount of a sampling point along the x-axis as expressed below.

$$dx = -k+1, -k+2, \dots, k-1, k.$$

Here, the symbol x' of the interpolated data $F_0'(x', y_e)$ is substituted by $k \cdot x + dx$ so as to give a spatial frequency power spectra in consideration of shifts of the sampling points.

(12) The paragraph from page 14, line 27 to page 14, line 34 has been amended as follows:

Next, the sampling noise removed data computing unit 58 ~~conduct~~ conducts re-sampling, based on the reference sampling data and the corrected data to compute sampling noise removed data. In the field distribution measuring method according to the present embodiment, odd number-th line data $F_0(x, y_o)$ and

Serial No. : 10/019,181
Filed : July 8, 2002

even number-th line corrected data $F_0''(x, y_e)$ are synthetically substituted to ~~be~~ produce sampling noise removed data $F(x, y)$ (step S14).

(13) The paragraph from page 15, line 1 to page 15, line 4 has been amended as follows:

Then, the computing/display unit 60 ~~develops~~ processes the sampling noise removed data $F(x, y)$ on the two-dimensional plane to thereby ~~provide~~ display a two-dimensional field distribution of electric fields or magnetic fields.

(14) The paragraph from page 15, line 5 to page 15, line 20 has been amended as follows:

~~FIG. 4 is~~ FIG. 4A and FIG. 4B are views of a field distribution of two-dimensional sweep measured data containing sampling noises in the conventional technology, i.e., measured data $F_0(x, y)$ developed on the two-dimensional plane as they are. These data are of a current distribution of a mobile telephone of 1.5 GHz, which was measured by using a small-antenna directivity evaluating apparatus. FIG. 4A shows a plane distribution of amplitude data. FIG. 4B shows a plane distribution of phase data. The shown data copy the measured data. Points where amplitudes or ~~phase~~ phases are equal are interconnected to show the distribution. The rectangular portion at the center of the drawings indicates the body of the mobile telephone. The straight line extended from the rectangle indicates the antenna. As shown, in the two-

Serial No. : 10/019,181
Filed : July 8, 2002

dimensional images, the distribution is disturbed in the x-axis direction, which apparently indicates occurrences of sampling point shifts.

(15) The paragraph from page 15, line 21 to page 15, line 29 has been amended as follows:

~~FIG. 5 is~~ FIG. 5A and FIG. 5B are views of a field distribution of two-dimensional sweep measured data with sampling noises removed by the algorithm of the present embodiment, i.e., sampling noise removed data $F(x,y)$ developed on the two-dimensional plane. FIG. 5A is a plane distribution of amplitude data. FIG. 5B is a plane distribution of phase data. As shown, the distributions of these two-dimensional images are smooth, and it is seen that the measured data $F_0(x,y)$ have been properly corrected.

(16) The paragraph from page 15, line 30 to page 16, line 9 has been amended as follows:

As described above, according to the present embodiment, the field distribution measuring method in which the probe is continuously ~~moved,~~ moved is comprised of the steps of sweeping a plurality of sampling points, measuring electric fields or magnetic fields to thereby measure a spatial distribution of the electric fields or magnetic fields, wherein a displacement amount of a sampling point is judged based on spurious spectra generated by the displacement between positions of the probe and timings of the measurement,

Serial No. : 10/019,181
Filed : July 8, 2002

and, in consideration of an amount of the displacement, a distribution of the electric fields or magnetic fields is measured, whereby measuring noises generated by the displacement between probe positions and measuring timings can be properly removed.

(17) The paragraph from page 16, line 13 to page 16, line 19 has been amended as follows:

For example, in the above-described embodiment, the field distribution measurement screen 10 is two-dimensional. However, the field distribution measurement screen 10 may be three-dimensional. In this case, the adjustment data have 2 two or more groups. The adjustment parameters are 2 two or more, and the spatial frequency power spectra for the evaluation are two or more dimensional.

(18) The paragraph from page 16, line 31 to page 17, line 11 has been amended as follows:

In the above-described embodiment, as a most desirable state, a shift amount for minimizing an accumulated ~~values~~ value of spatial frequency power spectra is utilized to remove measuring noises, but a shift amount for minimizing an accumulated value of spatial frequency power spectra may not always need to be used. ~~In the present embodiment, as a most desirable state, a shift amount for minimizing an accumulated value of spatial frequency power spectra is used. However,~~ the The effect of the present invention is achieved by setting

Serial No. : 10/019,181
Filed : July 8, 2002

a shift amount dx at a value which makes an accumulated value of spatial frequency power spectra smaller than that without measuring noises removed. Accordingly, measuring noises may be removed by utilizing a shift amount which makes an accumulated value of spatial frequency power spectra below a prescribed value, e.g., below $1/10$ of an accumulated value of spatial frequency power spectra without measuring noises removed.

(19) The paragraph from page 17, line 14 to page 17, line 30 has been amended as follows:

According to the field distribution measuring method and apparatus ~~according to~~ of the present invention, in measuring spatial distribution of electric fields or magnetic fields by ~~the probe continuously sweeping,~~ sweeping and measuring at a plurality of sampling points by a probe, which involves spurious spectra generated due to displacement between positions of the probe and measuring timings, a shift amount of the sampling is computed, and a distribution of electric fields or magnetic fields is measured in consideration of the shift amount, whereby measuring noises generated due to offsets of sweeping positions of the probe and the measuring timings can be properly removed. The present invention is useful as field distribution methods and apparatuses for measuring two-dimension distributions of electric fields or magnetic fields of small-antenna directivity evaluating

Serial No. : 10/019,181
Filed : July 8, 2002

apparatuses, electromagnetic wave monitor visualizing
apparatuses, etc.